

## **Determination of API Gravity of Liquid Petroleum Products**

### Scope

This method covers the determination, using a glass hydrometer, of the density, relative density (specific gravity) or API gravity of crude petroleum, liquid petroleum products or mixtures of petroleum and nonpetroleum products normally handled as liquids and having a Reid vapor pressure of 26 lbs or less. Measurements may be made in the units of local convenience and converted to equivalent values in either of the other two systems.

### Summary

The sample is brought to the prescribed temperature and transferred to a cylinder at approximately the same temperature. The appropriate hydrometer is lowered into the sample and allowed to settle. After temperature equilibrium has been reached, the hydrometer scale is read and the temperature of the sample is noted. If necessary, the cylinder and its contents may be placed in a constant temperature bath to avoid excessive temperature variation during the test.

### Comments

If this method is used for viscous oils, sufficient time must be allowed for the hydrometer to reach equilibrium. A suitable meniscus correction must be applied for opaque oils.

### Apparatus and Materials

- A. Glass Hydrometer: graduated in units of density, relative density (specific gravity), or API gravity as required.
- B. Hydrometer Cylinder: clear glass, plastic, or metal. The inside diameter of the cylinder shall be at least 25 mm greater than the outside diameter of the hydrometer used in it. The height of the cylinder shall be such that the appropriate hydrometer floats in the sample with at least 25 mm clearance between the bottom of the hydrometer and the bottom of the cylinder.
- C. Thermometers: ASTM 12F

- D. Constant Temperature Bath: for use when the nature of the sample requires a test temperature much above or below room temperature.

#### Procedure

- A. Bring the hydrometer cylinder and thermometer to approximately the same temperature as the sample to be tested.
- B. Transfer the sample to a clean hydrometer cylinder without splashing to avoid the formation of air bubbles and to reduce to a minimum the evaporation of lower boiling constituents of more volatile samples. Remove any air bubbles formed, after they have collected on the surface of the sample, by touching them with a piece of clean filter paper before inserting the hydrometer.
- C. Place the cylinder containing the sample in a vertical position in a location free from air currents. Ensure that the temperature of the sample does not change appreciably during the time necessary to complete the test. A constant-temperature bath may be necessary to avoid excessive temperature changes.
- D. Lower the hydrometer gently into the sample. Take care to avoid wetting the stem above the level to which it will be immersed in the liquid.
- E. Watch the thermometer and record the temperature as soon as a steady reading is obtained.
- F. Depress the hydrometer about two scale divisions into the liquid and release it. The remainder of the stem must be kept dry. With samples of low viscosity, impart a slight spin to the hydrometer on releasing it to assist in bringing it to rest, floating freely away from the walls of the cylinder. Allow sufficient time for the hydrometer to come to rest and for all air bubbles to come to the surface.
- G. When the hydrometer has come to rest, floating freely away from the walls of the cylinder, estimate the scale reading to the nearest 0.05° API. The correct hydrometer reading is that point on the scale at which the principal surface of the liquid cuts the scale. Determine this point by placing the eye slightly below the level of the liquid and slowly raising it until the surface appears to become a straight line cutting the hydrometer scale.
- H. With an opaque liquid take a reading by observing, with the eye slightly above the plane of the surface of the liquid, the point on the hydrometer scale to which the

sample rises. This reading, at the top of the meniscus, requires correction. The correction for the particular hydrometer in use may be determined by observing the maximum height above the principal surface of the liquid to which oil rises on the scale when the hydrometer in question is immersed in a transparent oil having a surface tension similar to that to the sample under test.

#### Calculations

- A. Apply any relevant corrections to the observed thermometer reading and to the hydrometer reading.
- B. For opaque samples, make the appropriate meniscus correction to the observed hydrometer reading.
- C. Record to the nearest 0.1° API the final hydrometer scale reading.
- D. Convert the value to standard temperature by consulting the conversion tables.

#### Bibliography

Annual Book of ASTM Standards (1987) Vol. 05.01, Sec. 5, ASTM, Philadelphia, PA, D 1298